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ANALYSIS OF BIOLOGICAL CHARACTERISTICS OF *BRYOBIA RUBRIOCULUS* SCHEUTEN (ACARI: TETRANYCHIDAE) CONCERNING THE PHYSIOLOGICAL ASPECTS OF SOUR CHERRY

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ABSTRACT: Sour cherry is considered as an economically important fruit tree, providing a valuable and delicious fruit across the world. Recently, large numbers of the brown mite, *Bryobia rubrioculus* Scheuten (Acari: Tetranychidae) attacked sour cherry orchards of Hamedan, Iran. In 2013, biological experiments were conducted on two sour cherry cultivars under constant conditions (26 ± 0.5)ºC, (L:D) (16:8), and (60 ± 5) RH. Pre-imaginal development time was 22.4 and 24.89 days, gross fecundity rate was 11.59 and 9.87 eggs, and r_m assumed to be (was determined) 0.0164 and 0.0048 day^{-1} respectively. Few biological parameters of the brown mite had correlation with physiological aspects of the sour cherry. The results of this research provide important data about brown mite for integrate pest management.

KEY WORDS: Sour cherry, *Bryobia rubrioculus*, biology, host physiology

INTRODUCTION

Bryobia rubrioculus Scheuten (Acari: Tetranychidae) thrives on plum, sweet cherry and clover orchards of Iran, particularly in Kermanshah, Tehran, Hamedan, and Alborz (Khanjani 2004; Keshavarz-Jamshidian 2006; Eghbalian 2007; Honarparvar 2010; Honarparvar et al. 2010a, 2010b; Darbemamieh et al. 2011; Honarparvar et al. 2012; Honarparvar et al. 2013). This is an important mite, attacking a number of fruit trees in the western region of Iran (Khanjani and Haddad Irani-Nejad 2009). Baker and Turtle (1994) noted that the brown mite can complete its life cycle on almond, pear and peach trees, and prefers feeding on young leaves of host plants (Osakabe et al. 2000) during the cooler time of the day (Herbert 1962; Meyer 1974). Furthermore, in recent years, this mite has caused considerable damage in orchards in Turkey (Kasap 2008) and all over the world (Osakabe et al. 2000; Beers 2007). Different egg populations of this mite has been found on some tree species including sweet cherry, sour cherry, apple and plum , which the highest population was found on sweet-cherry (Honarparvar et al. 2011). *Bryobia rubrioculus* is known as a thelytokous mite (Helle and Pijancker 1985) and as a significant world-wide mite on peach, apple, pear and a few deciduous fruit trees (Jeppson et al. 1975). Honarparvar et al. (2010; 2014) studied demographic parameters of *B. rubrioculus* on sweet-cherry at different temperatures. Population parameters are important in the measurement of population growth capacity of species under specific conditions. These parameters are also used as indices of population growth rates responding to selected conditions and as bioclimatic indices in assessing the potential of pest population growth in a new area (Southwood and Henderson 2000). Furthermore Honarparvar et al. (2010b) studied population growth parameters of *Bryobia rubrioculus* on sweet-cherry, at nine constant temperatures and calculated the intrinsic rate of increase (r_m) at 20ºC, which is considered as the optimum temperature. It was mentioned by Forghani et al. (2011, 2013 and 2014) that the osmotic potential is a physiological factor, which describes the susceptibility of grain seeds to pest damage. Moreover, it was showed that in wheat, there is a (correlation) between kernel damage by sunn pest and seed hardness (Mottaghi 2007). Cell-Leakage would be a significant sign of frost toleration in almond trees (Imani et al. 2011). Therefore, it seems that host characteristics are effective on biological factors of pest, and the identification of these features may be used in the IPM strategies.

The main objective of the study was to determine the reproduction parameters of brown mite and the relationship between these parameters and the physiological aspects of the sour cherry.

MATERIALS AND METHODS

Mite colony

The brown mite collected from sour cherry orchards in Hamedan and reared in 2 generations in germinator: (25 ± 0.5)°C, (L: D) (16:8), and (60 ± 5) RH ,then developmental time of this mite on two sour cherry cultivars was concentrated at (26 ± 1)ºC, (L: D) (16:8), and (60 ± 5) RH in the laboratory of Bu Ali-Sina university, Hamedan, Iran.

Table1.
Developmental time (days) of *Bryobia rubrioculus* females at different cultivars of sour cherry.

		Cultivar	
		BN5150	BT5148
Developmental stages	Eggs	9.68 ± 0.143[a]	10.91 ± 0.451[a]
	Larvae	2.44 ± 0.154[b]	2.91 ± 0.456[a]
	Protochrysalis	2.36 ± 0.073[a]	2.45 ± 0.207[a]
	Protonymph	2.76 ± 0.283[a]	2.8 ± 0.2[a]
	Deutochrysalis	2.11 ± 0.087[a]	2.5 ± 0.167[a]
	Deutonymph	2.17 ± 0.118[a]	2.33 ± 0.167[a]
	Teliochrysalis	2.37 ± 0.089[a]	2.33 ± 0.167[a]
	Pre-imaginal development time	22.4 ± 0.471[b]	24.89 ± 1.033[a]
	Life span development	19.15 ± 0.021[a]	18.74 ± 0.021[b]

Means followed by different letters within a column are significantly different at the 0.05 level (LSD-test).

Table 2.
Female longevity of *Bryobia rubrioculus* at different cultivars of sour cherry.

Cultivar	n	Preoviposition period	Oviposition period	Postoviposition period	Adult longevity
BN5150	20	2.58 ± 0.208[a]	6.33 ± 0.65[a]	1.59 ± 0.403[a]	10.5 ± 0.826[a]
BT5148	8	3 ± 0.305[a]	5.63 ± 0.66[a]	0.82 ± 0.211[a]	9.44 ± 1.386[a]

Means followed by different letters within a column are significantly different at the 0.05 level (LSD-test).

100 (4*25) petri-dishes (10 cm diameter) were used as arenas, with a piece of sponge soaked in deionized water for each cultivar. Only one egg was placed on each Petri-dish leaflet. The detached sour cherry leaflets were replaced with fresh ones, every two or three days during the study. Each day, a dissecting microscope at magnifications of up to 70×, were used for developmental time, and the observations were continued up to the death of the cohorts.

Physiological factors

60 leaves were collected from each sour cherry cultivars, and prepared for leakage test (4*15 replication, small leaf-disc). Falcon-tubes were used as containers for the tests, consisting of a small leaf-disc and 10cc deionized water in each tube. pH, electrical conductivity (EC), osmotic potential (ψ_π) were measured after 24 hours in the lab by pH-meter, EC-meter and osmotic potential set (Vescor INC 1991) respectively. Leaf area for all samples (3*20 replication) was measured by a leaf-area meter, and leaves (3*20 replication) were gathered for dry and wet weight test. In each replication of two cultivars, the leaves were weighted separately (wet weight); afterwards, the leaves were placed into the oven for 48 hours at 50°C temperature (dry weight). Photosynthesis of leaves in the two cultivars (3*3 replication) was evaluated by the CI-340 Hand-Held photosynthesis system.

Analysis of data

Adult longevity and fecundity of the mite with different development time were compared using proc GLM and means (ls-means) procedures (SAS, 2002). If the model was significant, then means comparisons were made using the Fisher protected LSD test ($p < 0.05$). Since all data are whole numbers, standard deviation may be proportional to the mean and/or their effects might be multiplicative; hence, they were logarithmically transformed (Gomes and Gomes 1983). The relationship between mite biology and host physiology was described using linear regression: $Y= a+bx$, where y is the biological aspect (as dependent variable), x is the physiology parameter of the host (independent variable), a is the intercept and b is the slope of the fitted line.

Life table analysis

The data were analyzed based on the age-stage, two-sex life table theories (Chi and Liu 1985: Chi 1988) using the TWOSEX-MS Chart program. The population parameters were estimated (the means and standard errors) using the Bootstrap method. Furthermore, the age-specific survival rate (s_{xj}) (where $_x$ is the age and $_j$ is the

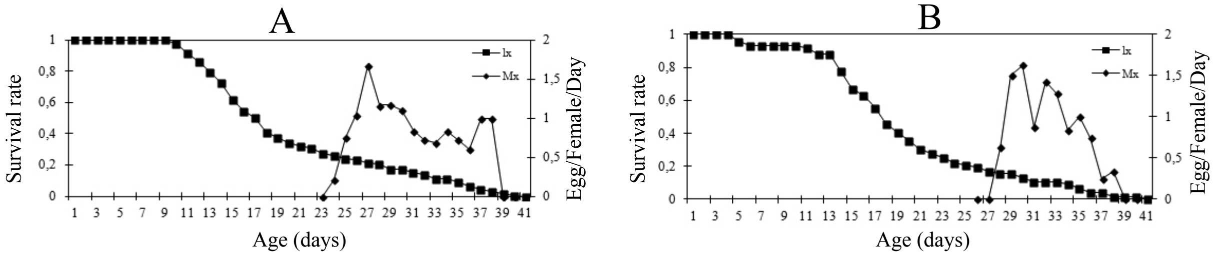

Fig. 1. Age-specific fecundity and survival rate of *B. rubrioculus* at different cultivars of sour cherry. (A) BN5150 and (B) BT5148, l_x is the proportion of alive brown mites at age *x*; m_x is the mean number of eggs laid per female at age *x*.

stage), age-stage specific fecundity (f_{xj}), age-specific survival rate (l_x), age-specific fecundity (m_x), and population parameters consist of intrinsic rate of increase (r_m), net reproduction rate (R_0), and the mean generation time (T) accordingly. The intrinsic rate of increase (r_m) is calculated using iterative bisection method:

$$1 = \sum_{x=0}^{\omega} L_x \infty m_x e^{-r\,m\,(x)}$$

with age indexed from 0 (Goodman 1982). To take stage differences into consideration, the l_x and m_x estimated by the subsequent formulae:

$$l_x = \sum_{j=1}^{k} S_{xj}$$

$$m_x = \frac{\sum_{j=1}^{k} S_{xj} f_{xj}}{\sum_{j=1}^{k} S_{xj}}$$

where k is the number of stages (Chi and Liu 1985). Since regarding this life table is extremely time consuming and replication is impractical, the Bootstrap method was used instead, for calculating life table parameters. The mean generation time is clarified as the time, when a population needs to increase R_0-fold of its size ($e^{rT} = R_0$ or $\lambda^T = R_0$) at the stable age-stage distribution. The mean generation time is assumed (as T= Ln R_0/r_m). Moreover, the calculation of life expectancy (e_x) is included in the raw data analysis ($e_x = T_x / l_x$) by the TWOSEX-MS Chart program is available at http://140.120.197.172/ecology (Chi 2008; Chi and Su 2006).

The reproductive parameters including gross fecundity rate, gross fertility rate, gross hatch rate, net fecundity rate, net fertility rate, mean eggs per day, and mean fertile eggs per day hence, were estimated by using the following equations (Carey 1993):

$$Gross\ fecundity\ rate = \sum_{x=\alpha}^{\beta} M_x$$

$$Gross\ fertility\ rate = \sum_{x=\alpha}^{\beta} M_x h_x$$

$$Gross\ hatch\ rate = \sum_{x=\alpha}^{\beta} M_x h_x \Big/ \sum_{x=\alpha}^{\beta} M_x$$

$$Net\ fecundity\ rate = \sum_{x=\alpha}^{\beta} L_x M_x$$

$$Net\ fertility\ rate = \sum_{x=\alpha}^{\beta} L_x M_x h_x$$

$$Daily\ eggs\ per\ female = \sum_{x=\alpha}^{\beta} M_x \Big/ (\varepsilon - \omega)$$

$$Daily\ fertile\ eggs\ per\ female = \sum_{x=\alpha}^{\beta} M_x h_x / (\varepsilon - \omega)$$

Where, L_x is the days lived in interval x and x+1; M_x is the average number of eggs produced by a female at age *x;* h_x is the hatching rate; α is the age of the female at the first oviposition, β is the age of the female at the last oviposition, and ε-ω is the female longevity.

RESULTS

Biological parameters

The two cultivars BN5150 and BT5148 were applied for rearing of the brown mite at 26°C (Table 1). The egg developmental stage showed the same level, however, there was a difference between larval stages significantly, also, Pre-imaginal development time had the mentioned result and further in BT5148. Life span development was high in BN5150. In both cultivars adult longevity of the mite was considered nearly equal. Although in BN5150, the oviposition and postoviposition period were longer than that of BT5148, there was no significant difference between this parameter and the other stages (Table 2).

Reproduction parameters

It can be clearly observed that the age specific survival rate at the mentioned temperature was level out on the first day's life, but dramatically decreased at day 10 to 18 and steadily continued on BN5150 as the brown mite aged. On the other

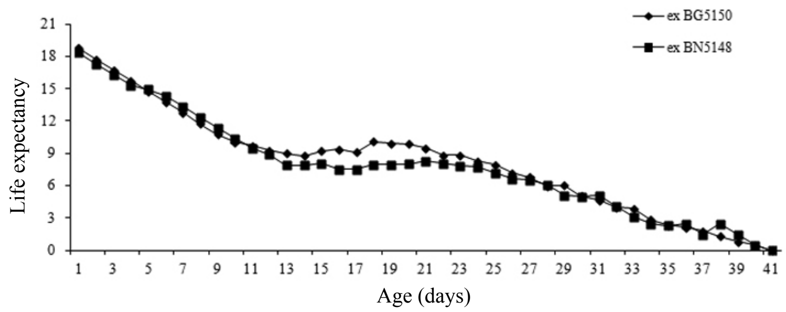

Fig. 2. Life expectancy (e_x) of the brown mite, *Bryobia rubrioculus* at different cultivars of sour cherry.

Table 3.
The reproduction parameters (Mean ± SEM) of the brown mite, *Bryobia rubrioculus* at various cultivars of sour cherry.

		Cultivar	
		BN5150	BT5148
Reproduction parameters	Gross fecundity rate	11.59 ± 0.053[a]	9.87 ± 0.053[b]
	Net fertility rate	1.32 ± 1.19[a]	0.59 ± 1.36[b]
	Net fecundity rate	1.48 ± 1.19[a]	0.80 ± 1.36[a]
	Gross fertility rate	10.31 ± 1.14[a]	6.41 ± 1.25[a]
	Gross hatch rate	0.89 ± 1[a]	0.74 ± 1[b]
	Mean eggs per female per day	0.68 ± 1.14[a]	0.67 ± 1.25[a]
	Mean fertile eggs per female per day	0.61 ± 1.14[a]	0.49 ± 1.25[a]
	n	20	8

Means followed by the same letters within columns are not significantly different by LSD-test ($P < 0.05$).

hand, the age specific survival rate on BT5148 slightly declined on 5th day leveled out to day 12 then was sharply reduced until day 23. The age-specific survival rate (l_x) was about 41 on the two cultivars. The age specific fecundity rate (m_x), (eggs/day) for *B. rubrioculus* was the same on both sour cherry (Fig. 1). Life-expectancy (e_x) of newborn eggs of this mite was 19.16 days in BN5150 and 18.72 days in BT5148 (Fig. 2). The reproduction parameters were depicted for the brown mite on the two sour cherry cultivars (Table 3). It was revealed that most characteristics of this mite on the two hosts did not show any significant differences. In contrast, there was a significant difference in the Gross fecundity rate, net fertility rate and gross hatch rate.

Population parameters

Table four presents the consequential factors of population parameters of *B. rubrioculus* on the two cultivars of the sour cherry. The net reproductive rate (R_0) and finite rate of increase (λ), the generation time (T_G) and intrinsic rate of increase (r_m) showed meaningful significant difference between BN5150 and BT5148.

Mortality

Considerably, there was an obvious discrepancy between the two total mortalities with respect to higher amount in BT5148 (Table 5). It seems that the larval mortality percent is the most important process which has seen in its life cycle.

Physiological parameters

Some physiological factors were compared in this study (Tables 6, 7, 8). Although the most values in all aspects were counted in BN5150, there were not any significant differences between cultivars (Table 6). Considering the data of EC, PH, W and ψ_π parameters, it was revealed that there were significant differences between BN5150 and BT5148 (Table 7). Photosynthesis (Pn) is the other important physiological parameter that was considered in this study. It is clear that BT5148 value was the highest, but there is no significant difference between BT5148 and BN5150 (Table 8).

Correlation and Regression Analysis

The results showed that the gross fecundity rate (GRR) is related with leaf weight (W) and

Table 4.
Comparison of population parameters of *Bryobia rubrioculus* at two cultivars of sour cherry.

	Cultivar	
	BN5150	BT5148
R_0 (females/♀/generation)	1.641 ± 0.021[a]	0.927 ± 0.021[b]
r_m (day[1])	0.0164 ± 0.0002[a]	0.0048 ± 0.0003[b]
T_G (days)	29.09 ± 0.032[b]	30.93 ± 0.031[a]
l (day[1])	1.016 ± 0.0003[a]	0.996 ± 0.0003[b]

Table 5.
Mortality of the brown mite, *Bryobia rubrioculus* at different cultivars of sour cherry.

	Cultivar	
	BN5150 (n)	BT5148 (n)
Eggs	10 (10)	26 (26)
Larvae	63.33 (57)	79.73 (59)
Protochrysalis	6.06 (2)	0 (0)
Protonymph	12.9 (4)	6.67 (1)
Deutochrysalis	3.7 (1)	0 (0)
Deutonymph	15.38 (4)	7.14 (1)
Teliochrysalis	0 (0)	0 (0)
Total mortality (%)	78 (78)	87 (87)

Electrical conductivity (EC) (Table 9). Both the net reproductive rate (R_0) and finite rate of increase (λ) showed adaptation with PH, EC and osmotic Potential (ψ_π) as well (Table 9). Besides, it was revealed that there was a significant relationship between intrinsic rate of increase (r_m), which is the most significant characteristics of the mite, and temperature (T) and EC. All regression equations are presented in the same table.

RESULTS AND DISCUSSION

Temperature is a key factor in the biology the mite (Honarparvar et al. 2012, 2014; Javadi Khederi et al. 2014, Javadi Khederi and Khanjani 2014; Kasap 2004, 2008). It affects survival and development time of *B. rubrioculus*. We applied natural temperature parameters in our experiments. Since no significant differences was observed in biological aspects of the brown mite, it is concluded that the conditions and characteristics of two different hosts were the same for the brown mite. The egg developmental stage was determined 9.68 and 10.91 days on BN5150 and BT5148, respectively. Likewise, the stage calculated 10.6 at 25ºC and 9.8 days at 27.5ºC on sweet cherry for the brown mite (Honarparvar et al. 2012). It was reported 8.7 and 9.3 days on Golden and Starking (apple cultivars) at 25ºC (Kasap 2008) whereas, 15.3 days on the apple at 18.5ºC (Herbert 1962). Moreover, on the sour cherry, it was showed 12.56 at 25ºC (Eghbalian 2007) and 13.2 days at 22ºC by Keshavarz-Jamshidian (2004). Pre-imaginal development time of *Bryobia rubrioculus* on BN5150 and BT5148 was 22.4 and 24.89 days, respectively. In addition, the longevity and oviposition period counted 10.5, 6.33, 9.44 and 5.63 days, respectively. As a result, pre-imaginal development time was 20.5 days at 25ºC and 18.01 days at 27.5ºC also. Oviposition and longevity stage were calculated 5.1 days and 8.0 days at 25ºC, and 4.8 and 6.5 days at 27.5ºC for *B. rubrioculus* on the sweet cherry by Honarparvar et al. (2012). Kasap (2008) depicted oviposition and longevity stage 9.0 and 14.2 days on Golden apple, 13.6 and 18.8 days on Starking apple at 25ºC. In the same manner, the reproduction parameters of age-specific survival rates (l_x) and life-expectancy (e_x) were calculated 40 and 19.16 on BN5150, 41 and 18.72 on BT5148 and on sweet cherry, was concluded at 27.5ºC, 37 and 14.89; also, 39 and 18 at 25ºC respectively (Honarparvar et al. 2014; 2010) and the age-specific survival rate (l_x) was observed 35 and 42 on apple (*Malus domestica* L. cv Golab) at 25ºC and 27.5ºC subsequently for the brown mite (Javadi Khederi and Khanjani 2014). Furthermore, the means of gross

Table 6.
Comparison of physiological parameters of *Bryobia rubrioculus* on two cultivars of the sour cherry.

Cultivar	n	Physiological parameters (mean ± SE)		
		La (cm)	Wwl (g)	Dwl (g)
BN5150	3	12.67 ± 1.28[a]	19.71 ± 1.09[a]	9.19 ± 1.09[a]
BT5148	3	12.46 ± 1.28[a]	17.79 ± 1.09[a]	8.66 ± 1.09[a]

Means followed by the same letters within columns are not significantly different by LSD-test (P < 0.05). La = Leaf area; Whl = Wet weight of leaf; Dwl = Dry weight of leaf.

Table 7.
Comparison of physiological parameters of *Bryobia rubrioculus* on five cultivars of sour cherry.

Cultivar	n	Physiological parameters (mean ± SE)			
		Ec (mmho/cm)	ψ_π(MP)	pH	W (g)
BN5150	4	87.23 ± 1.05[a]	-0.061 ± 1.10[a]	6.80 ± 1[b]	0.040 ± 1.02[a]
BT5148	4	67 ± 1.05[b]	-0.041 ± 1.10[b]	7.08 ± 1[a]	0.035 ± 1.02[b]

Means followed by the same letters within columns are not significantly different by LSD-test (P< 0.05). Ec = Electrical conductivity; ψ_π = Osmotic Potential; W = Weight of leaf-disc.

fecundity, net fertility rate and eggs per day were 11.59, 1.32 and 0.68 on BN5150. In addition, the data were 9.87, 0.59 and 0.67 for BT5148; There is a correlation between the following results and that of Honarparvar et al. (2010, 2014) at 27.5ºC (28.2, 1.5 and 1.7 eggs) as well, at 25ºC (29.9, 1.8 and 1.7 eggs) respectively. Population parameters were accounted 0.0164, 1.641 and 1.016 on BN5150; 0.0048, 0.927 and 0.996 on BT5148 related to intrinsic rate of increase (r_m), net reproductive rate (R_0) and finite rate of increase (λ) which were reckoned in turn, 0.055, 2.93 and 1.06 at 27.5ºC as well, 0.056, 3.01 and 1.06 (females/female/day, females/female, day^{-1}) at 25ºC on sweet cherry (Honarparvar et al. 2010b). Kasap (2008) declared 0.106 and 12.54 for r_m and R_0 on Golden while, 0.107 and 17.62 on Starking apple at 25ºC. In the similar study, Javadi Khederi and Khanjani (2014) reported 0.0120 and 1.32 (r_m and R_0) on apple for the same mite at 27.5ºC. It seems that although temperature is an important factor on population parameters, host attributes would simulate and make disparate changes considerably. The mortality showed total death,78 and 87 percent on BN5150 and BT5148, that was similar to the estimations of 76.67% at 27.5ºC and 68.33% at 25ºC by Honarparvar et al. (2010a, 2012). Previous studies explained the biological stages of the brown mite increase due to host plant characteristics and temperature (Herbert 1962; Keshavarz-Jamshidian 2004; Eghbalian 2007; Kasap 2008; Honarparvar 2010). The intrinsic rate of increase (r_m) and fecundity have been used as indices of population especially on tetranychidae by Sabelis (1985). Rotem and Agrawal (2003) mentioned plant size and quality can influence mite dynamics and/or the chemical constitution of the leaf may have an effect on the development time on immature stages of spider mites (Crooker 1985). Moreover, the host leaf traits are considerable in understanding the feeding behavior of the mite (Tomczyk and Kropczynska 1986). Thus, the host physiological elements were surveyed. We pulled a result the leaf-area of BN5150 was measured 12.67 cm which is more than BT5148. As well, the wet and dry weight of the leaf-discs were observed 19.71 and 9.19g on BN5150, and 17.79 and 8.66 g on BT5148, therefore no significant difference was observed in the aspects between them. Leakage tests consist of EC, ψ_π and pH; and leaf-disc weight and photosynthesis (Pn) were also examined on both hosts simultaneously. As it turns out, EC, ψ_π and W on BN5150 were the higher value while, pH was the lower, in this regard there was significant difference with the exception of Pn (µmol/m^2/s). The negative correlation between gross fecundity rate with some factors (EC, W) proved that the increasing of these aspects may result to lower fecundity rate of the mite. The regression equation characterized temperature has close adjustment with intrinsic rate of increase (r_m) (Honarparvar et al. 2012; Kasap 2008; Kasap 2004) and simultaneously with electrical conductivity (EC). In this regard, osmotic potential (ψ_π) with other leakages factors (EC and PH) could be considered highly effective on the net reproduc-

Table 8.
Comparison of Photosynthesis of *Bryobia rubrioculus* on five cultivars of the sour cherry.

	n	BN5150	BT5148
Pn (µmol/m2/s)	3	1.77 ± 1.33[a]	1.84 ± 1.33[a]

Means followed by the same letters within columns are not significantly different by LSD-test (P< 0.05).

Table 9.
Regression equations between the brown mite biological aspects and sour cherry physiology factors (α = 0.05).

	Equation	
Gross fecundity rate	GRR = 0.166 – 0.003w – 0.06EC	CV = 7.8, R^2 = 0.65, F_{value} = 7.55
Finite rate of increase	λ = 21.99 + 18.03T – 11.11PH – 0.82 ψ_π + 5.69EC	CV = 7.87, R^2 = 0.65, F_{value} = 7.32
Net reproductive rate	R_0 = 94.8 + 0.46T – 0.28PH +14.25EC – 0.02 ψ_π	CV = 1.78, R^2 = 0.64, F_{value} = 7.26
Life cycle	Lc = –11.59 + 1.39whl	CV = 8.7, R^2 = 0.75, F_{value} = 11.92
Total fecundity	Tf = 11.07 + 0.2 la	CV = 7.86, R^2 = 0.58, F_{value} = 5.05
Tpp	Tpp = 31.63 – 0.18T	CV = 0.55, R^2 = 0.78, F_{value} = 14.47
Life span development	Ls = 18.07 + 0.42 T	CV = 0.53, R^2 =0.80, F_{value} = 15.63
Intrinsic rate of increase	r_m = 26.56 + 25.16 T + 0.2 la	CV = 7.86, R^2 = 0.58, F_{value} = 5.55

tive rate (R_0). This means that the physiological qualities of the host influence the mite biological aspects. Similarly, Tajbakhsh (2000) observed that EC increase on plants brought about high levels of pest activity. Next, a relationship was found between frost and cell-leakages (Lang et al. 1994; Orvar 2000). Also, seed hardness is more effective against the sunn pest (Mottaghi 2007). Moreover, ψ_π and EC data showed a correlation between pest damage and seed plant, based on the fact that in a few seed cultivars of wheat and barley tested for this aim, it was elucidated that the more leakage of seed, the more pest-injury (Forghani et al. 2014).

The results of leakage tests with pest effect were proved by the other studies like Forghani et al. (2014), Forghani et al. (2013), Ameglio et al. (2005) and Lindon (2002). Moreover, the accessible effect of food or energy resources could show positive correlation with gross fertility and net fertility rate (Speight et al. 2008). Therefore, the present findings may help other research and can be a basis for finding new aspects of correlation between pest biological attributes and plant physiological components.

In conclusion, the brown mite could continue its life on the two sour cherry cultivars with regards to their survival mentioned circumstances even though there was a high mortality rate which can be probably the result of some material on the leaves that are destructive and would cause the death to the mite stages. However, there are some correlation between mite biological aspects and characteristics with the material of the sour cherry. These findings can be potentially useful in an IPM program.

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